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water resources management in Central Asia,
German-Kazakh University, Almaty

Managed Aquifer Recharge (MAR) on Central Asian Transboundary Kabul River Basin

www.ckrb.org

LaMEC

www.lamec.org/

zhanay.sagintayev@nu.edu.kz

Floods and Droughts in Central Asia

Reservoir- dam
Upstream of Astana city

7

Reservoir- dam
Upstream of Astana city

8

Floods in Akmola and Karaganda regions 2015

Satrytobe town
(РИА «Новости» – 13.04.15)

Nura River
Mustafino town (ДЧС)

9

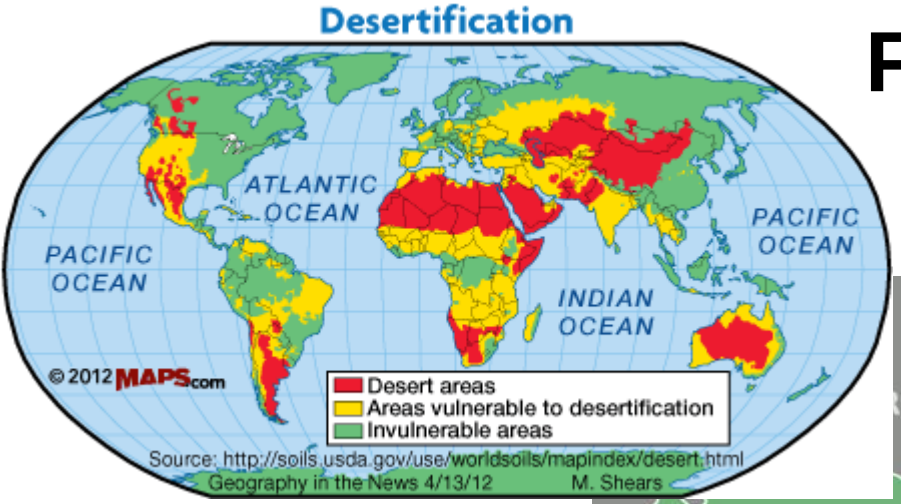
Floods in Akmola and Karaganda regions 2014

Kokpektin reservoir crash, Karaganda region
30.04.14
1.5 M cub m *(Today.kz)*

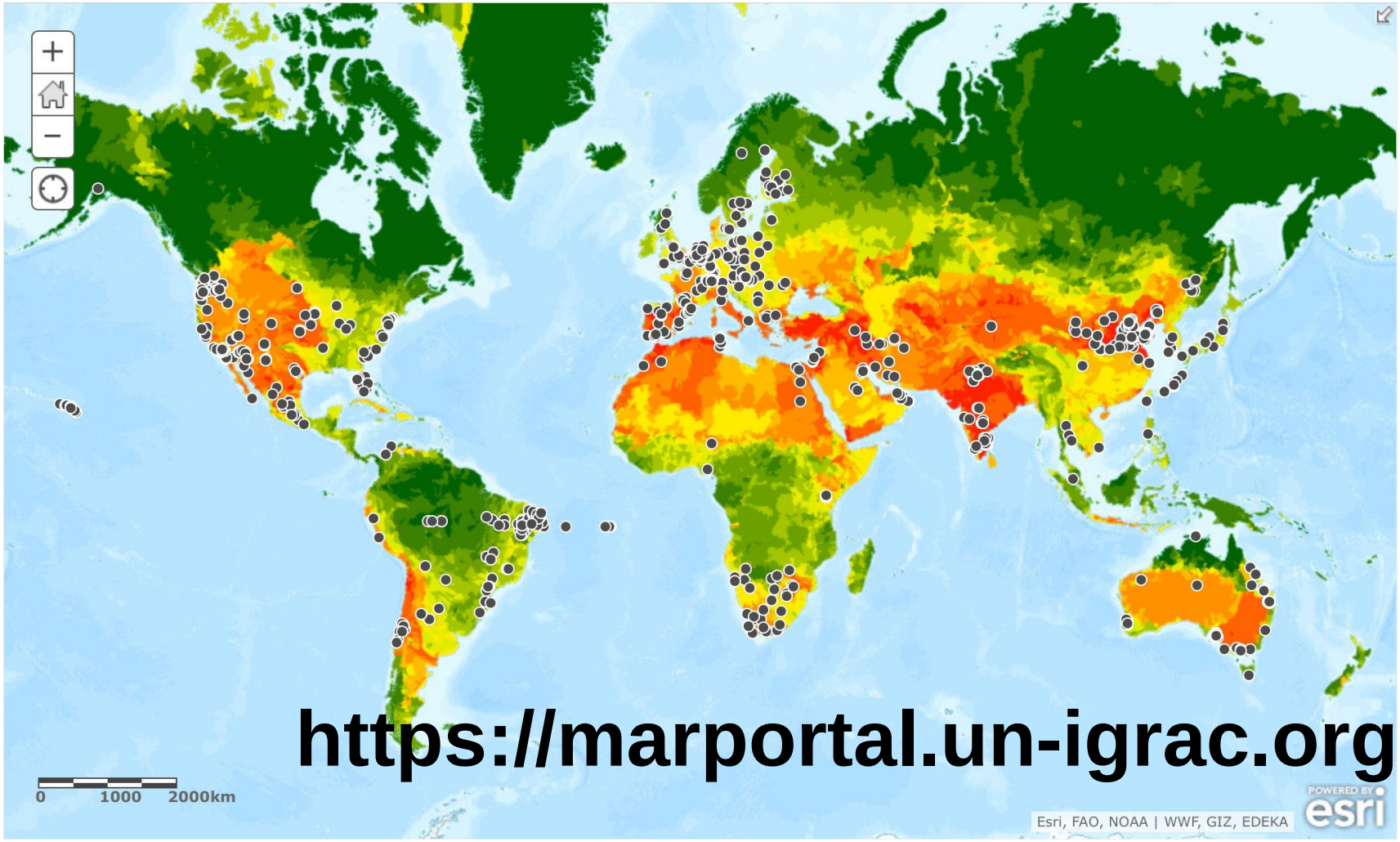
- **Kazakhstan's Situation**

Floods – Droughts (desertification)

Floods and Droughts in Central Asia



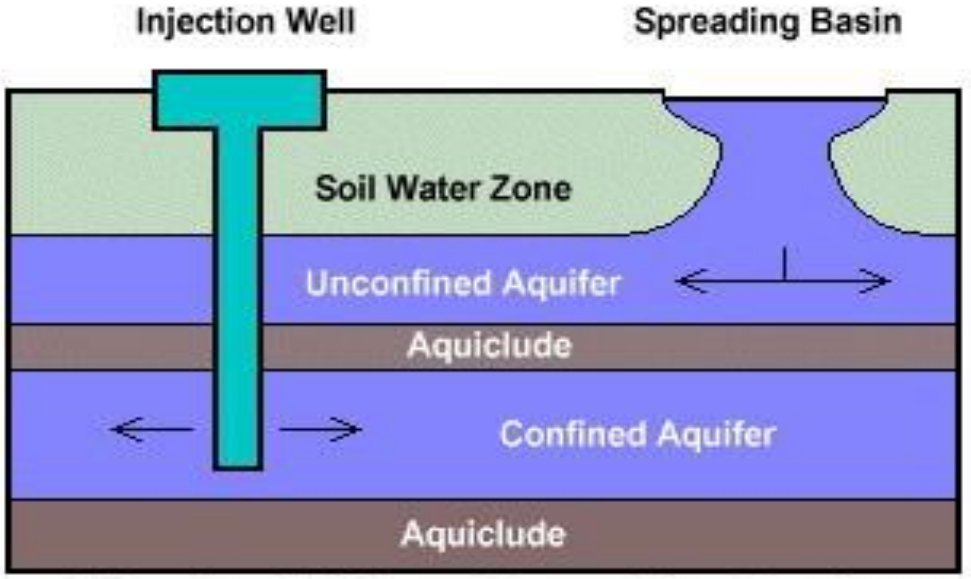
MAR for global change mitigation



Global MAR Portal

What is ASR?

Artificial Storage and Recharge/Recovery



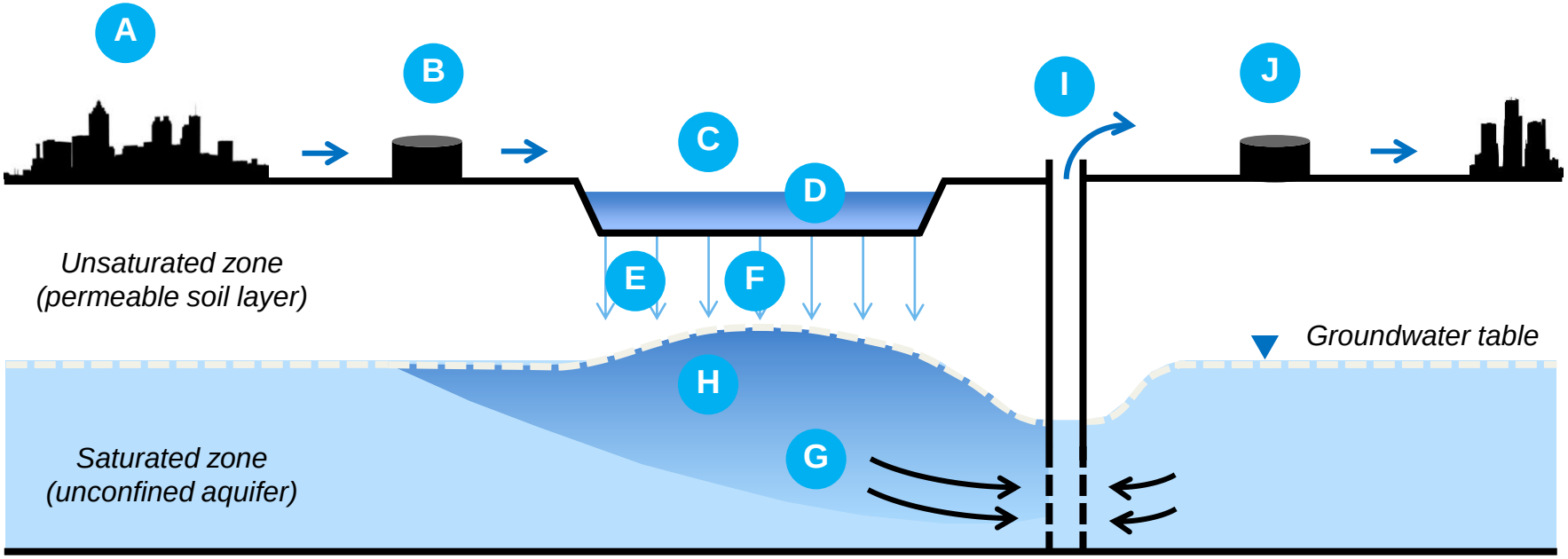
Injection Well vs. Spreading Basins

ASR is a water resource management tool, using below ground storage of water with the intent to recover water at a later date.

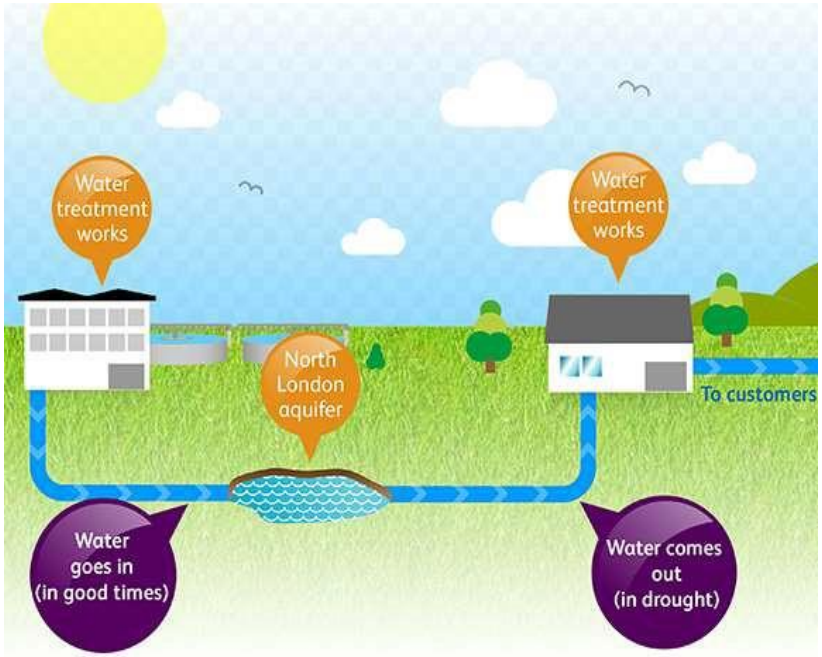
MAR processes

- **Unconfined aquifers**

A. Water collection
B. Pre-treatment
C. Evaporation
D. Clogging
E. Transport unsaturated zone
F. Transformation unsaturated zone
G. Transport saturated zone
H. Transformation saturated zone
I. Recovery
J. Post-treatment

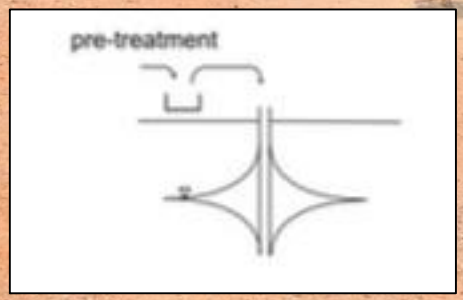


Example: Enfield – Harringey London



Salisbury, AUSTRALIA

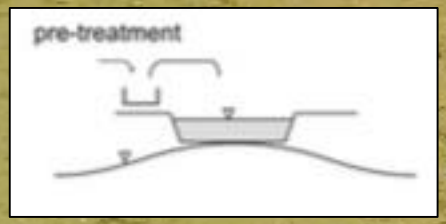
Since: 2008
MAR type: Aquifer storage and recovery
Influent: Rain water
Final use: Agriculture (irrigation)
Purpose: Maximize natural storage



Source: Stefan, 2012

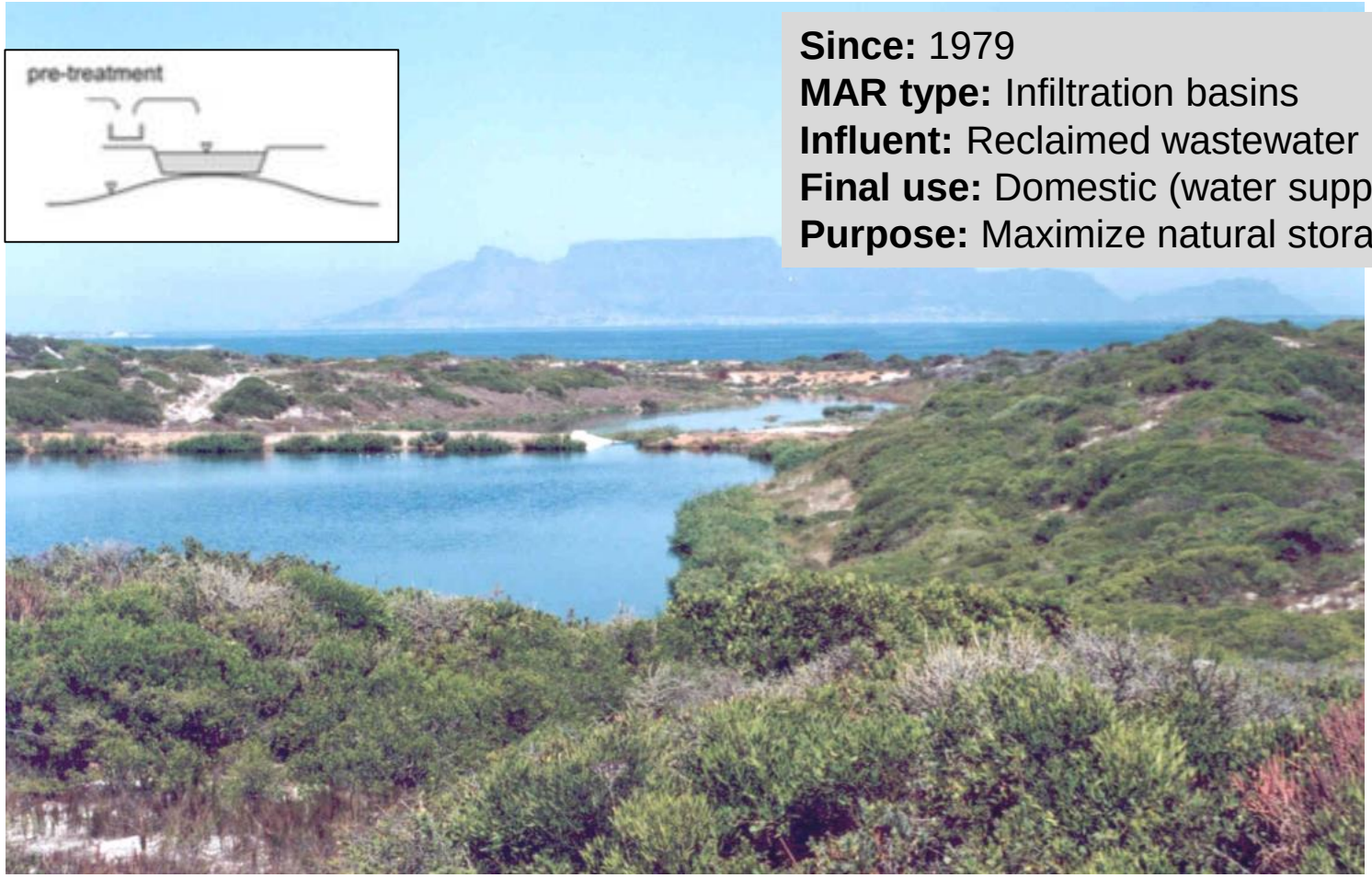
Shafdan, ISRAEL

Since: 1977
MAR type: Infiltration basins
Influent: Reclaimed wastewater
Final use: Agriculture (irrigation)
Purpose: Water quality management



Source: Stefan, 2012

Atlantis, SOUTH AFRICA



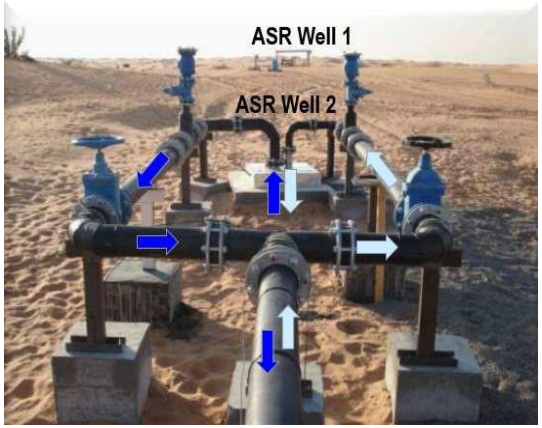
Since: 1979
MAR type: Infiltration basins
Influent: Reclaimed wastewater
Final use: Domestic (water supply)
Purpose: Maximize natural storage

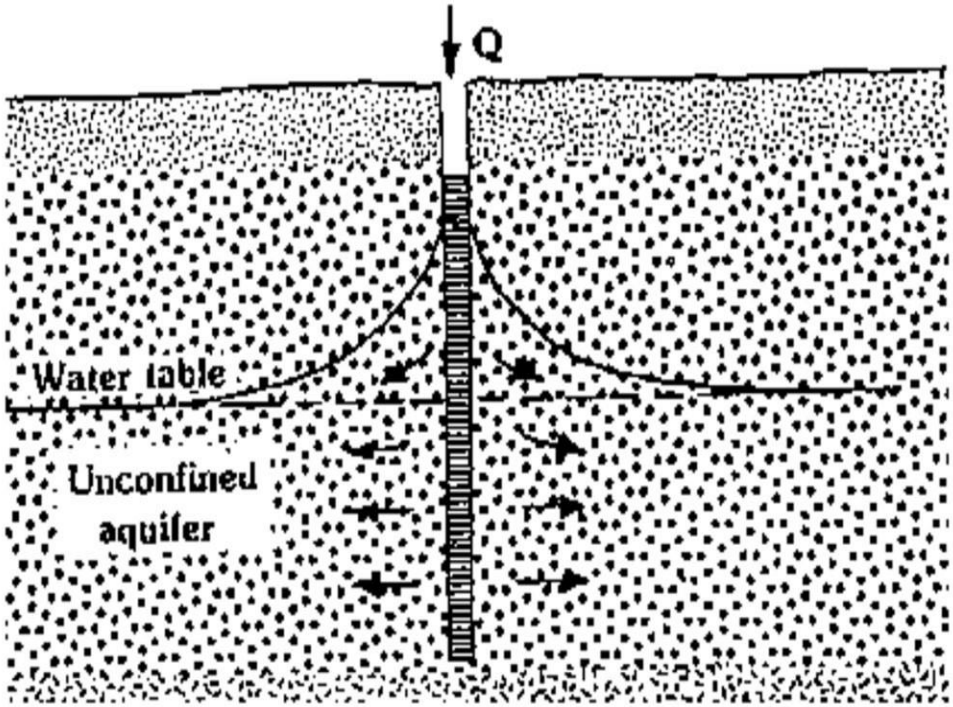
Source: Murray, 2009

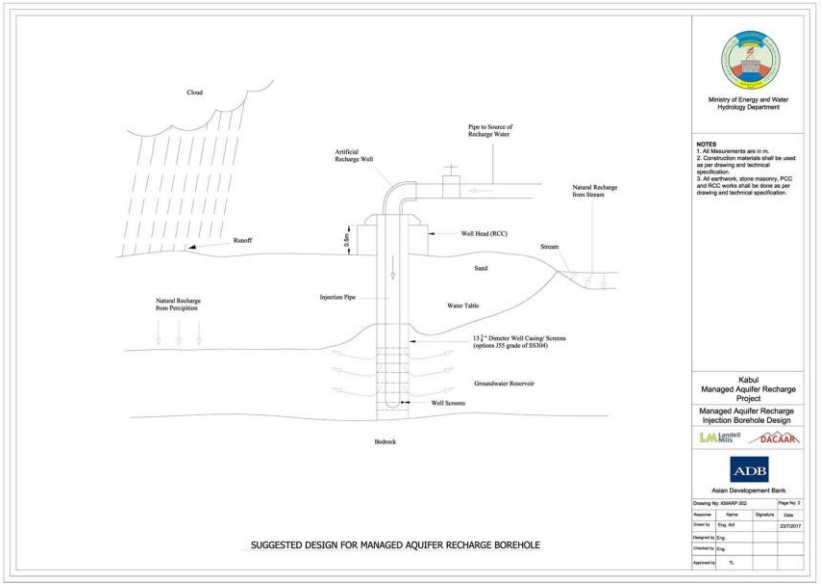
Kabul Managed Aquifer Recharge (MAR) Project Introduction to MAR for other ADB Projects

Recharge Boreholes -

It is the direct opposite of a pumping well. A recharge well pushes back surface water into the groundwater system



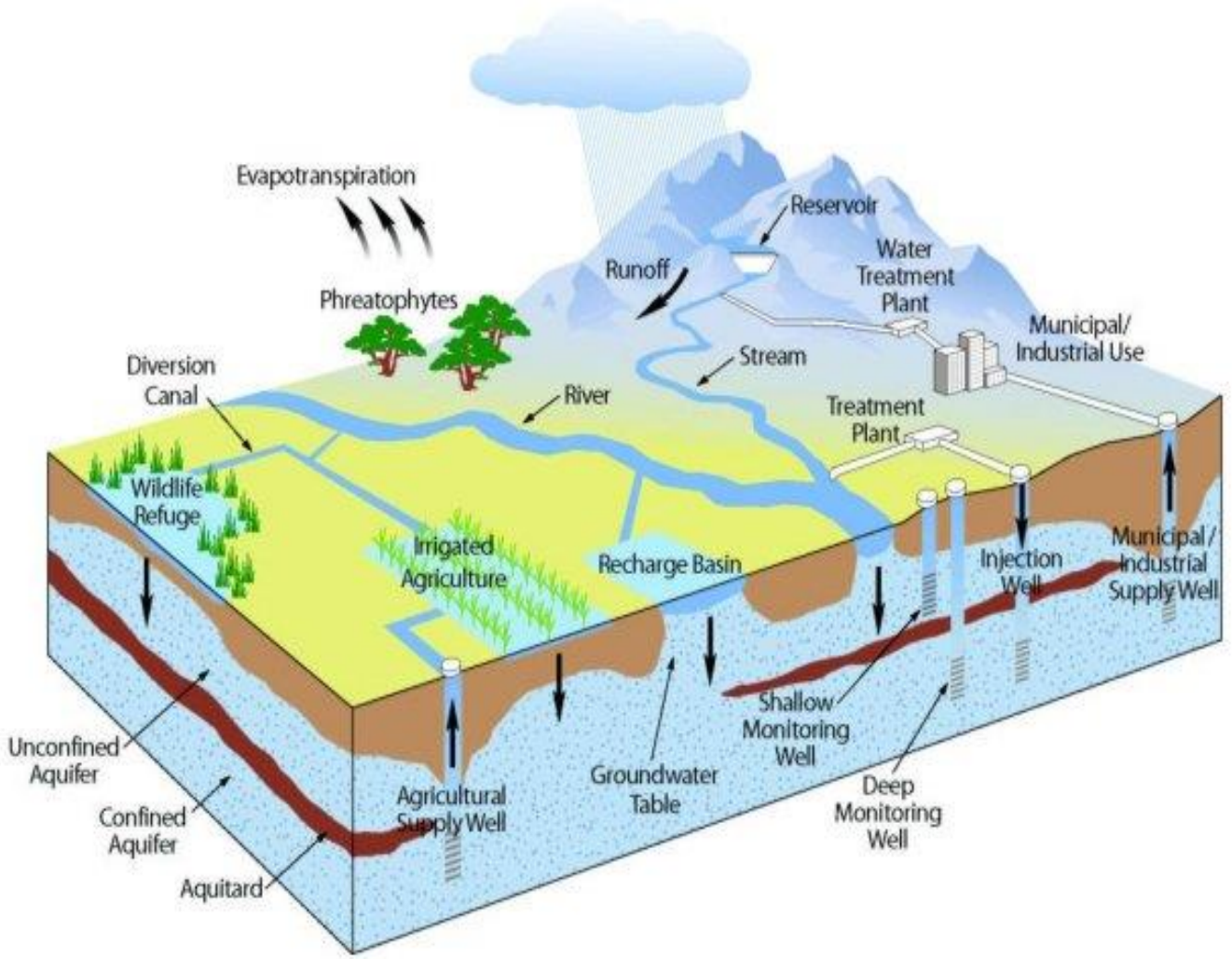




ABOVE SURFACE TUBE WELLS

ABOVE SURFACE TUBE WELLS

Research field



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Chitral-Kabul River Basin

Satellite enhanced snow-melt flood and drought predictions for the Kabul River basin with surface and groundwater modeling

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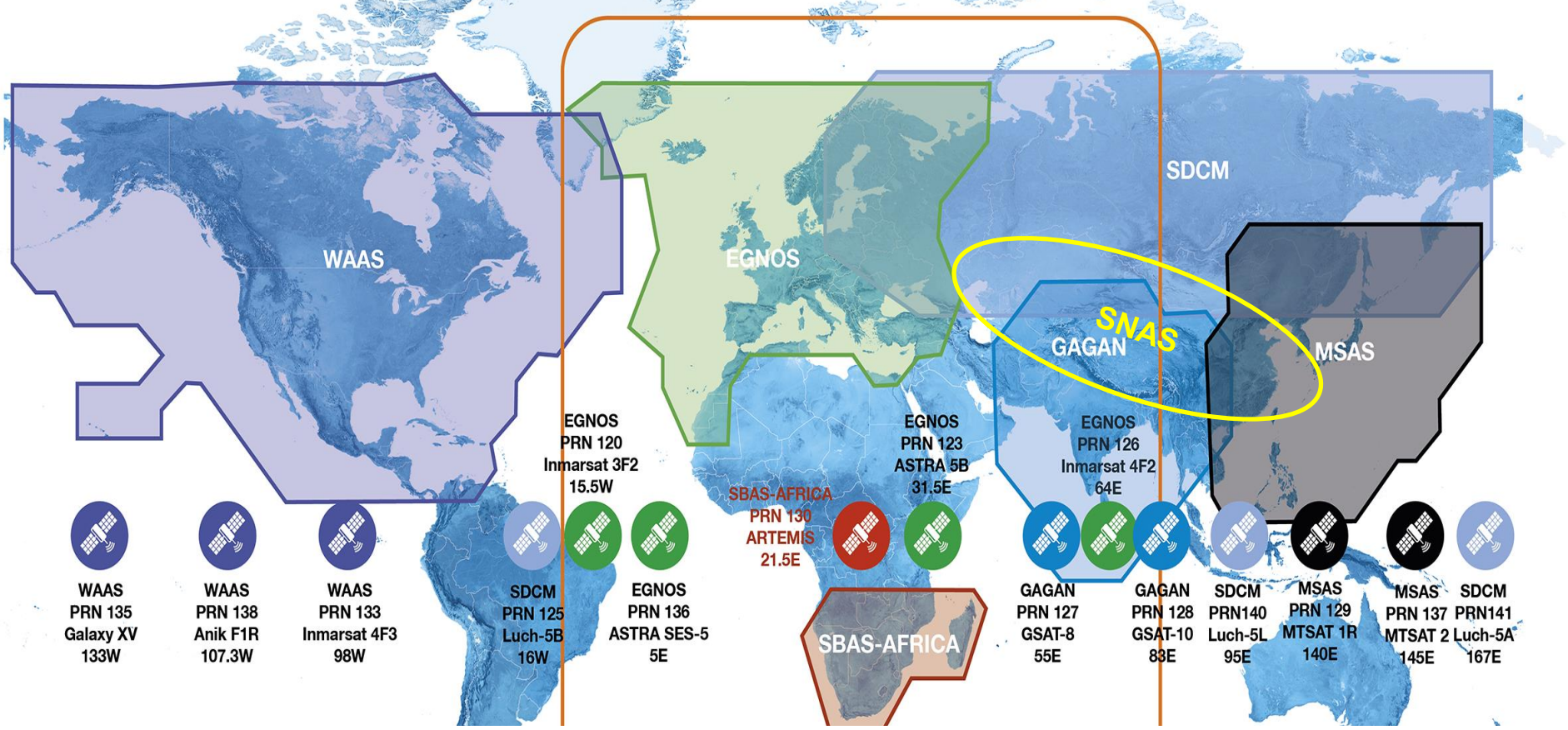
Kabul Polytechnic University

SATELLITE ENHANCED SNOWMELT FLOOD AND DROUGHT PREDICTIONS FOR THE KABUL RIVER BASIN (KRB) WITH SURFACE AND GROUNDWATER MODELING

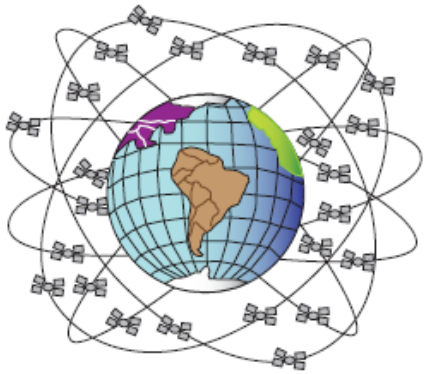
Under Partnerships for Enhanced Engagement in Research (PEER), cycle 5, awarded project is to develop the integrated surface and grou
(Pakistan upstream and Afghanistan downstream) Kabul River Basin (KRB) with Satellite Enhanced Snowmelt Flood and Drought Prediction
data to track snow, snow melting, floods, surface water coverage, and droughts over the KRB. We adapt the cost-effective approaches that util
from the Red River Basin, Dr. Jacobs, Department of Civil and Environmental Engineering, Environmental Research Group, Infrastructure and C

The methodologies and expertise of the NASA supported project: «Satellite Enhanced Snowmelt Flood Predictions in the Red River of the No
new research area of KRB. A lack of accurate snow depth and snow water equivalent data, and a lack of understanding of snowmelt processes



Satellite-Based Augmentation System (SBAS):

- Wide Area Augmentation System (WAAS - North America)
- European Geostationary Navigation Overlay Service (EGNOS)
- CDGPS (Canada and continental United States)
- MTSAT Satellite Based Augmentation System (MSAS - Japan)
- GPS-Aided GEO Augmented Navigation system (GAGAN – India)
- System for Differential Corrections and Monitoring (SDCM - Russia)
- Satellite Navigation Augmentation System (SNAS – China)



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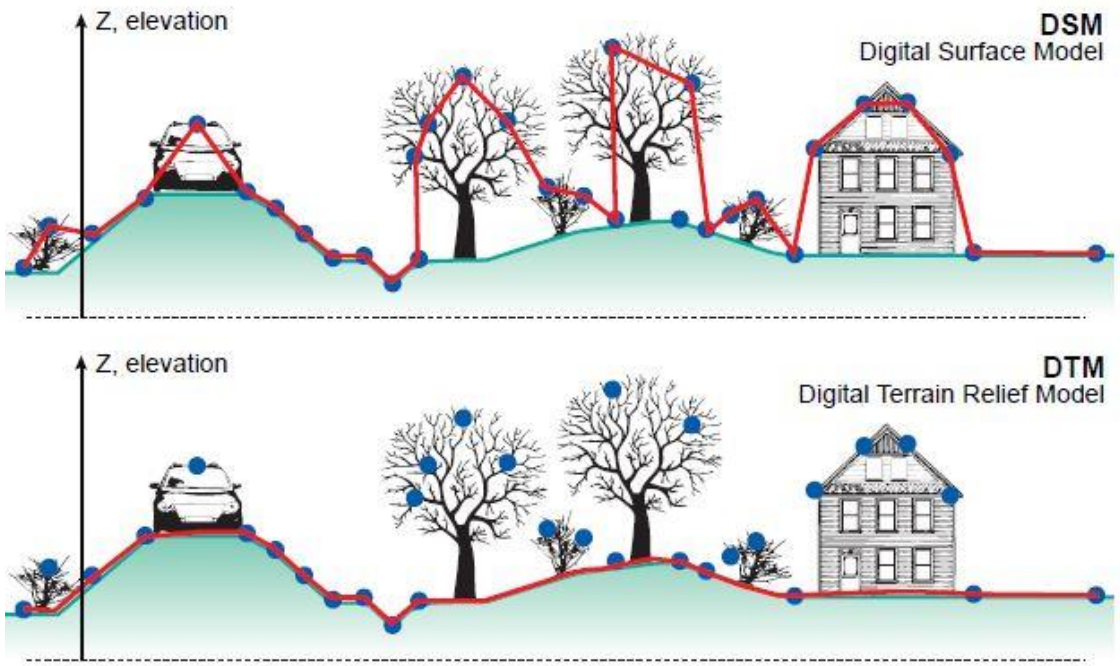
Приложение

ма расположения участка под геодезический полигон

DEM-DSM-DTM

Types of **Digital Elevation Models (DEM)**:

- A **Digital Surface Model (DSM)** provides elevations of the surface water and the top of all earth objects.
- A high resolution **Digital Terrain Model (DTM)**, which provides elevations of the bare earth-terrain relief and river bottoms, is valuable for many earth studies applications requiring accurate water volume calculations, particularly for flood studies.



DEM-DSM-DTM

1. Stereo DEM-DSM, calibration, verification, field data

2. Bathymetry (water depth) model (BM)

3. DTM

DSM - BM

Garbage in, Garbage out (GIGO)

The output quality depends on Input data quality

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Внедрение экологически чистой технологии солнечной энергии для водоснабжения

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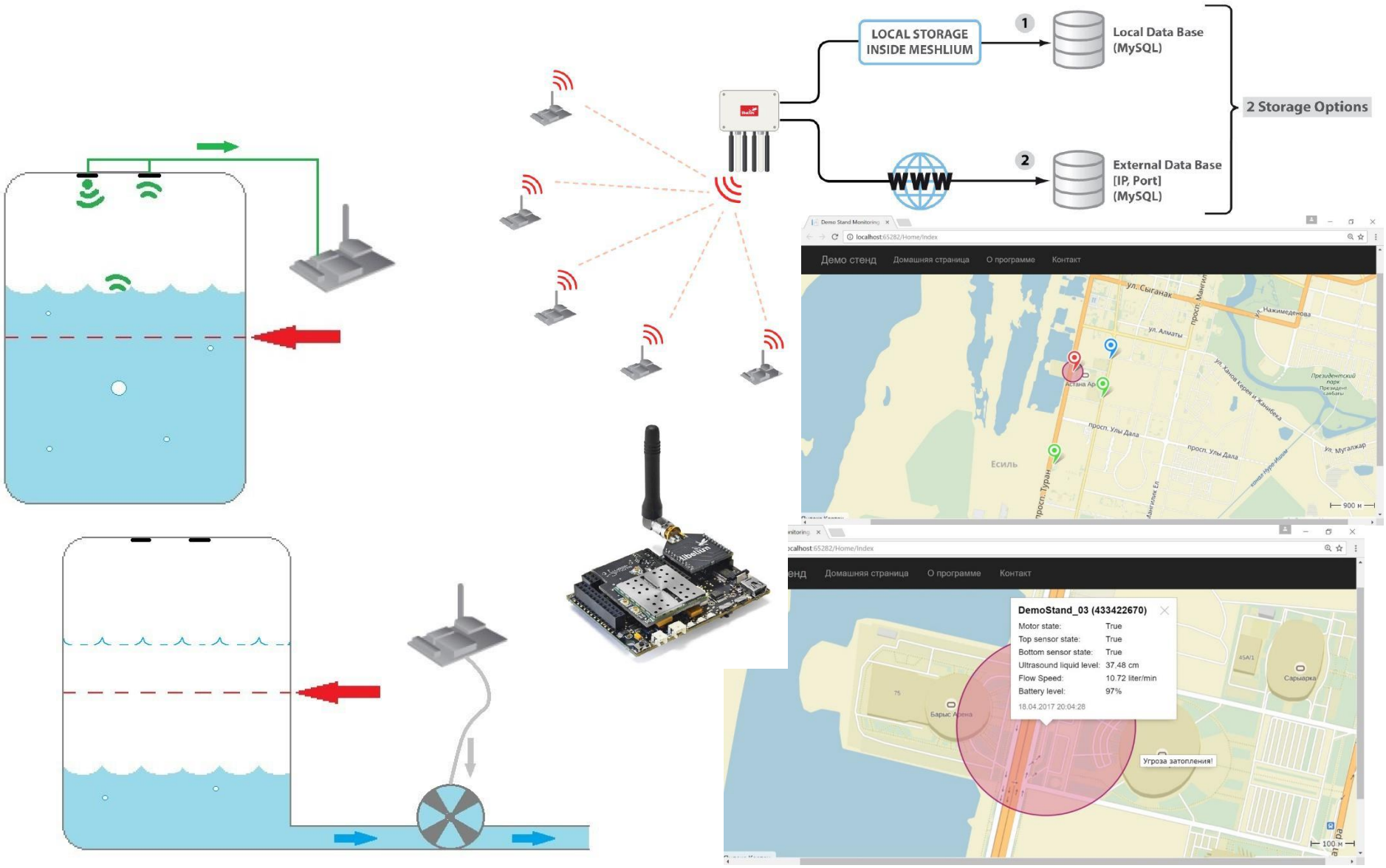
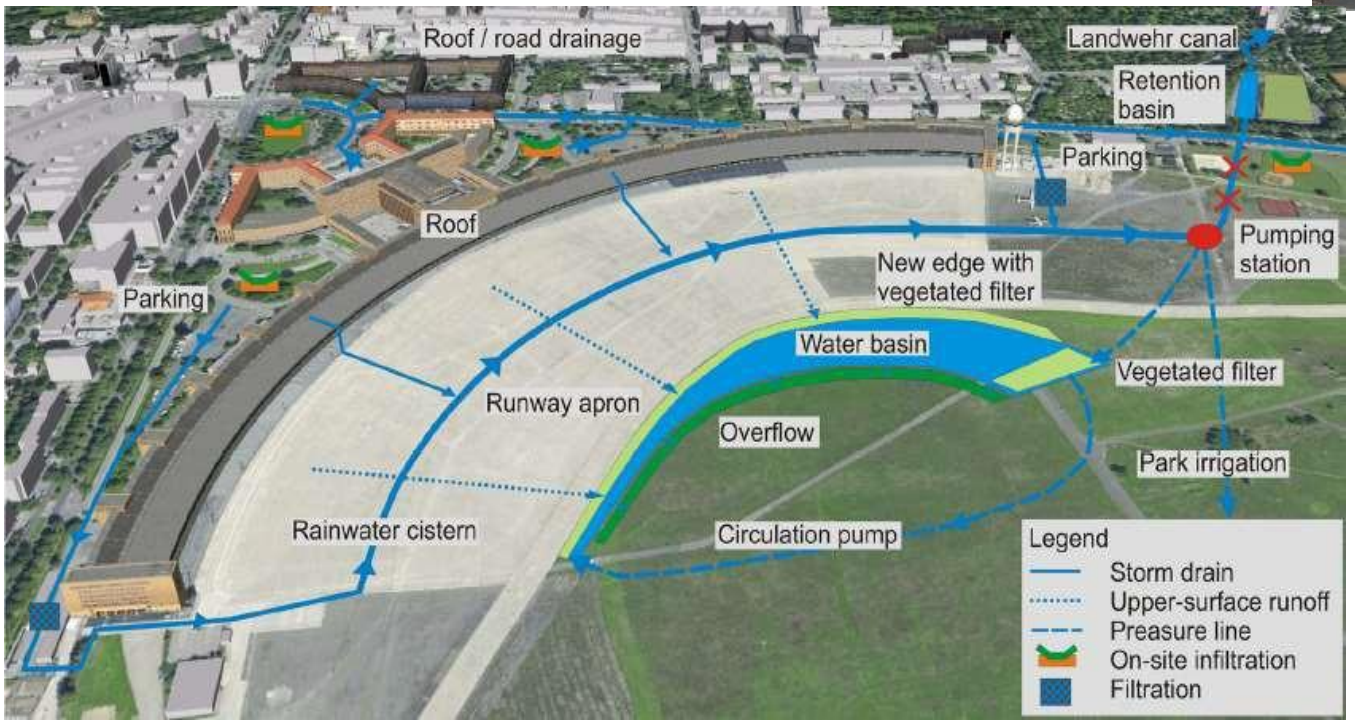
Automated Sensor technologies for storm water management



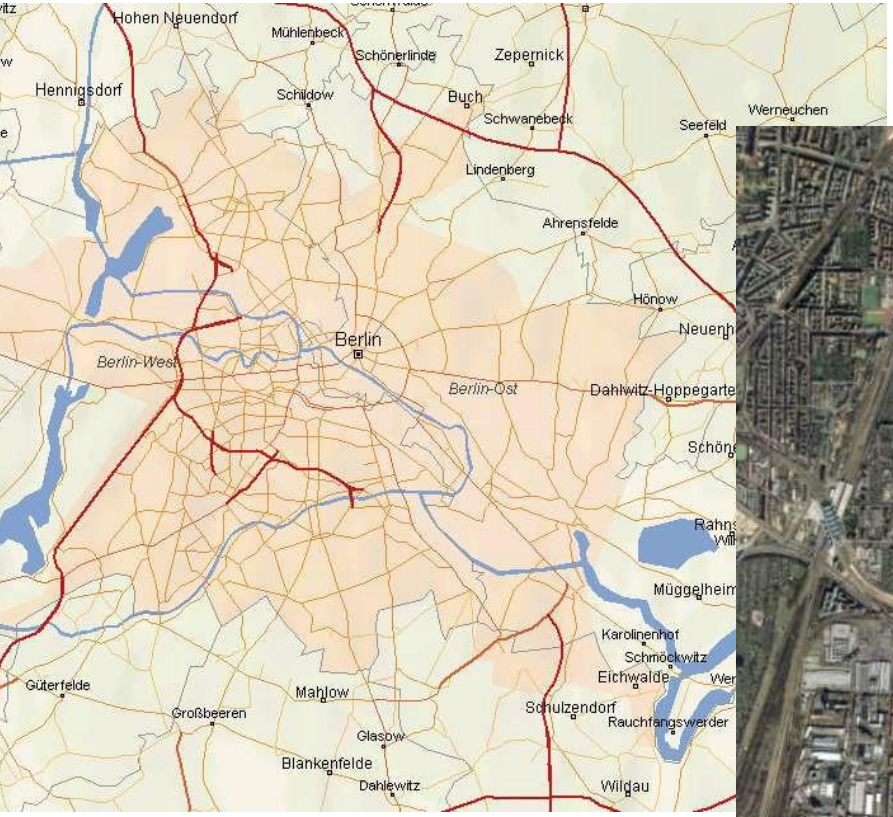
Snow Storm water filtering



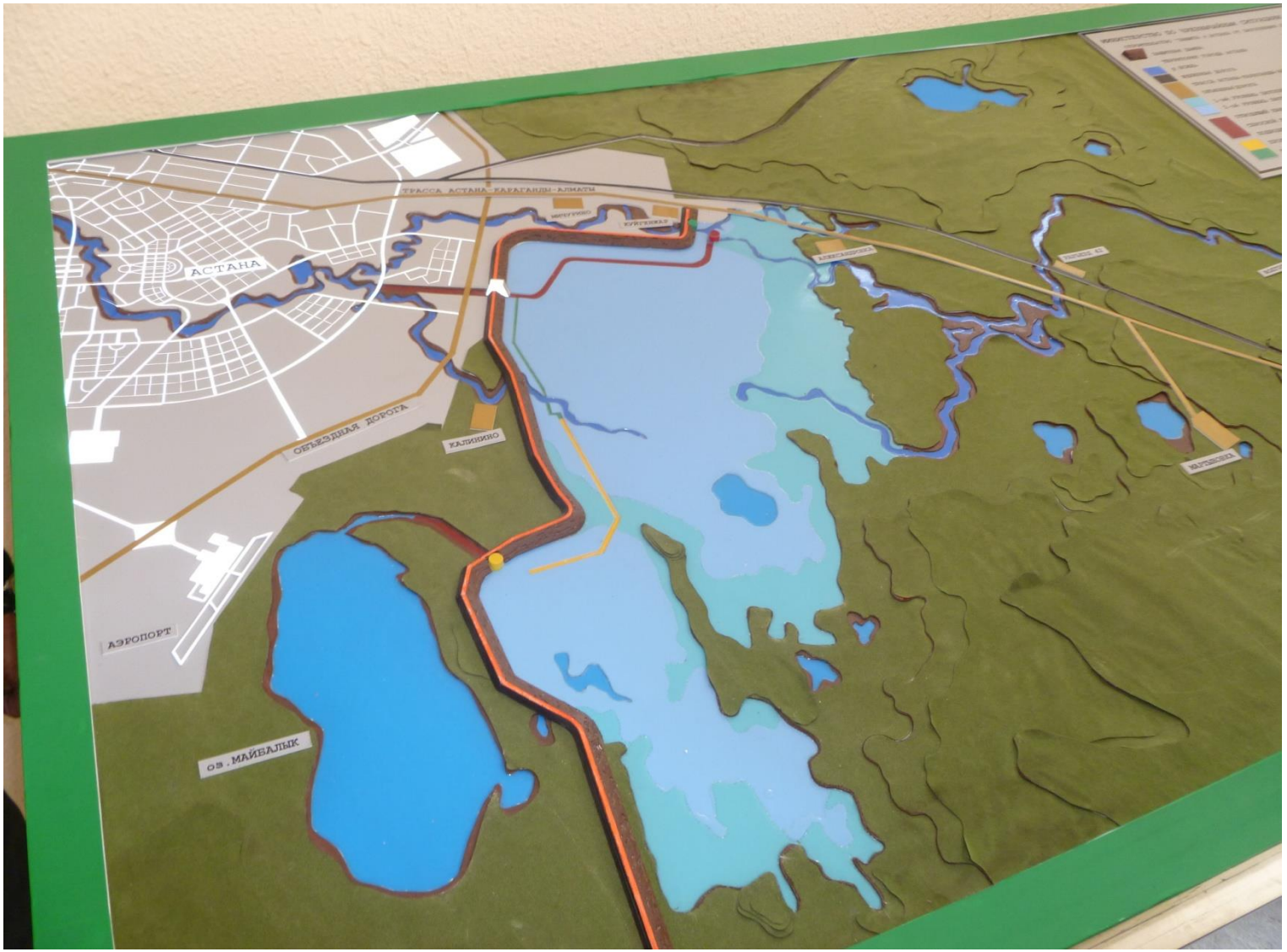
Blue Green Dream

Snow Storm water filtering

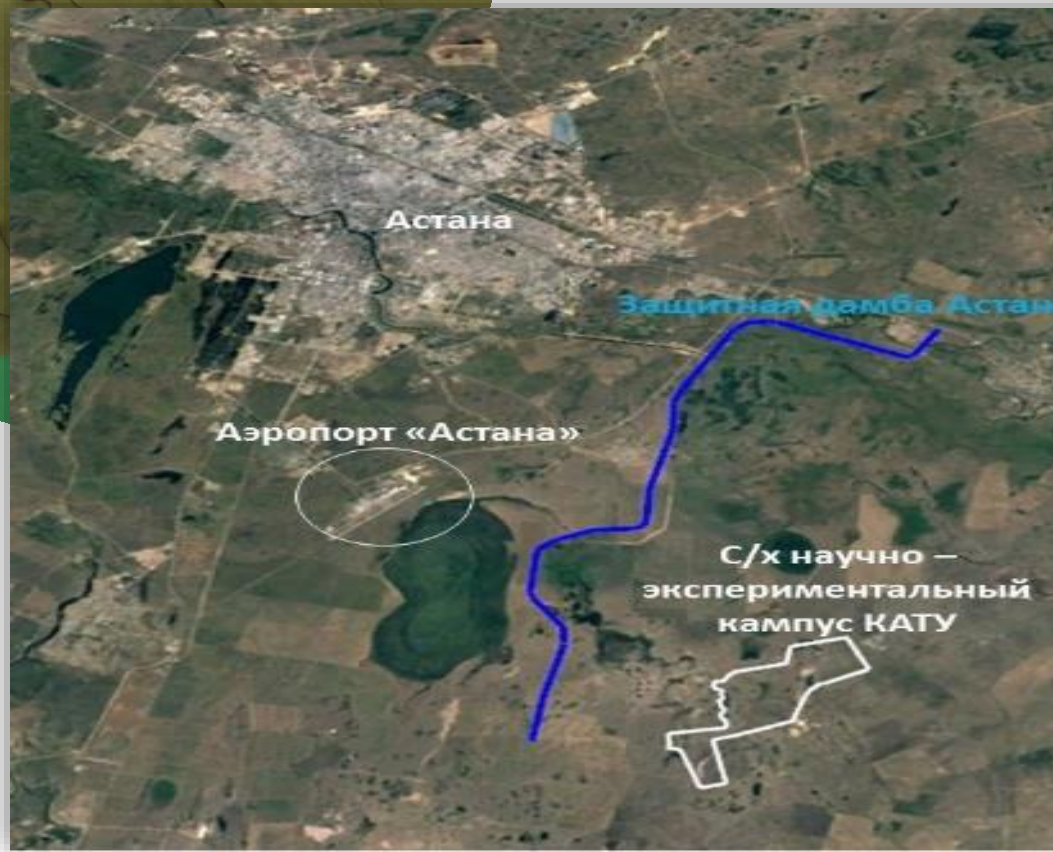
Tempelhof Airport – Berlin, Germany



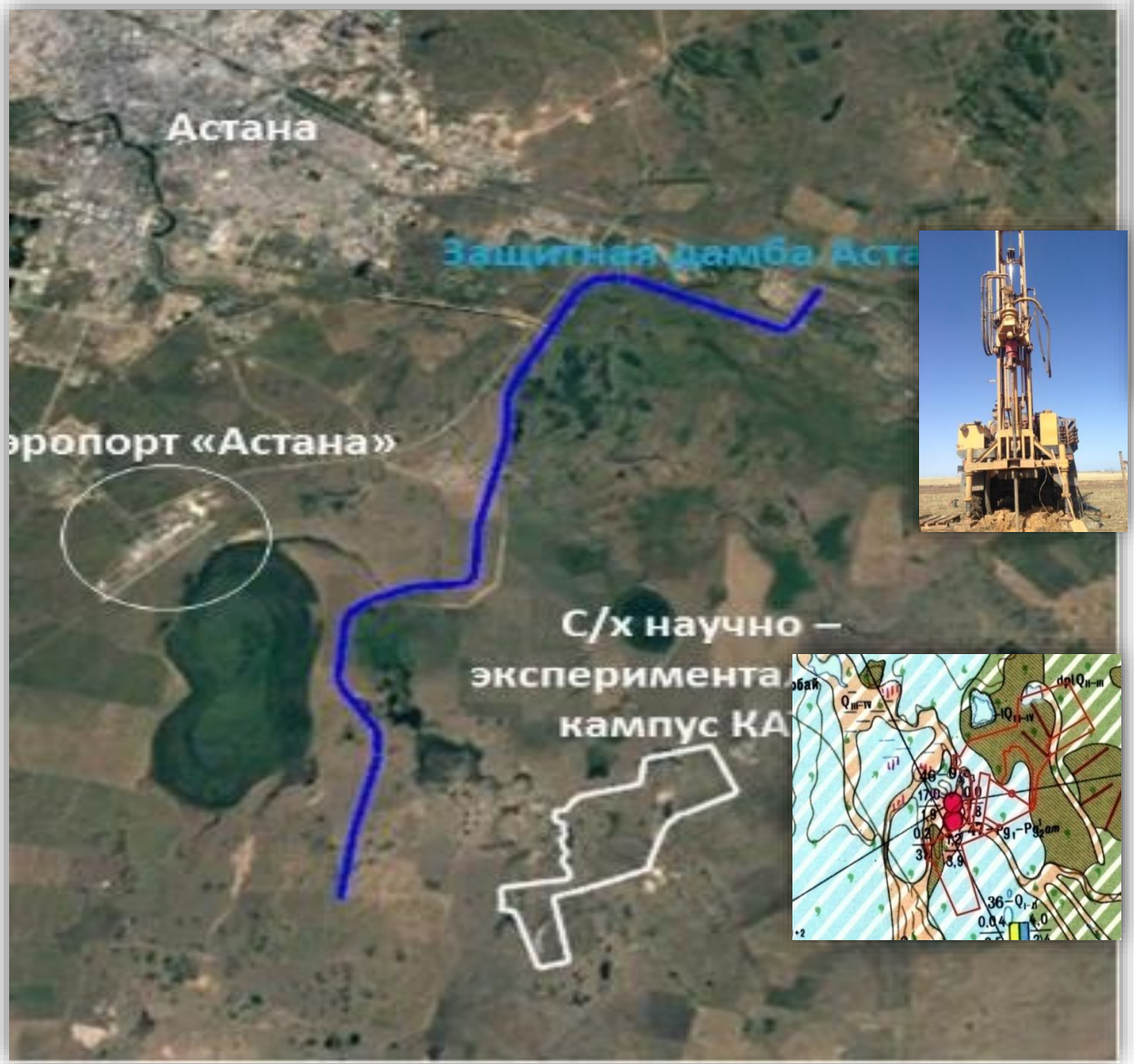
Reservoir- dam
Upstream of Astana city




ОБЪЕЗДНАЯ ДОРОГА
КАЛИЙКИО
ОПОРТ
ОЗ. МАЙБАЛЫК


Астана
Защитная дамба Астан
Аэропорт «Астана»
С/х научно –
экспериментальный
кампус КАТУ

Snow collection, snow melt, filtration, MAR on Astana Agro-Technical University agro field site



Hydrogeological research in the territory of agro field site showed the absence of fresh water at a depth of up to 200 m.

The only solution was the use of snow melt water accumulation.

In 2017 the snow melt water accumulation system was developed

Snow collection, snow melt, filtration, MAR on Astana Agro-Technical University agro field site

Indicators	Variety «Xisen 3»	Variety «Xisen 6»	Recognized variety «Nevsky»
Average yield	40 tons / ha	70 tons / ha	17 tons / ha
Average weight of tubers	120 gr.	150 gr.	80 gr.
Output of commercial products	75,5%	75,5%	70%
Starch content	16%	16%	13%

6 varieties of potatoes were tested on the area of 35 hectares.

Germany - Kazakhstan
Flood management
Mining pits for flood water

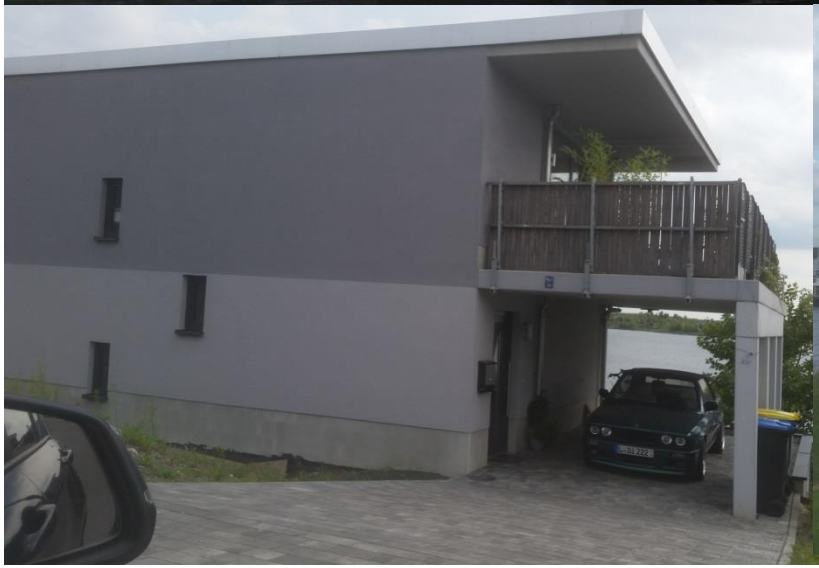
https://euracoal.eu/info/country-profiles

http://aboutkazakhstan.com

https://euracoal.eu/info/country-profiles

http://aboutkazakhstan.com


Schiffbare Gewässerverbindung zwischen Zwenkauer und Cospudener See
Verdichtung des Untergrundes der Trasse
Cospudener See
Zwenkauer See
Hier entsteht auf Kippensand der zukünftige Hartlkanal
Wegeführung außerhalb der Bauzeit
LMBV



Secure | https://asp.tu-dresden.de/eng/index.html

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Deutsch

INSTITUTE OF NUCLEAR AND PARTICLE PHYSICS

RADIATION PHYSICS GROUP

- Welcome
- Education
- Research
- About Us
- Research Services
- Impressum

OncoRay – Radiation Research in Oncology

SAD-GWT Strahlenschutz-Akademie DRESDEN an der GWT-TUD GmbH

Welcome at the Homepage of the Radiation Physics Group

https://inowas.hydro.tu-dresden.de

particular importance to facilities, in industry or

DRESDEN concept Exzellenz aus Wissenschaft und Kultur

FREE WEB-BASED MODELLING PLATFORM

Managed aquifer recharge (MAR) represents the purposeful recharge of an aquifer for later water recovery or for environmental benefits. To meet various site-specific requirements, different water infiltration techniques are available, making MAR a reliable instrument for sustainable groundwater management. The present platform provides a collection of free web-based tools aimed at planning, management and optimization of main components of MAR schemes:

Water Resource Management

Dynactive™ Power

Solar Floating Cover for the supply of water and electric power in rural areas

Division ContiTech of Continental AG

JAPAN

is building the

WORLD'S LARGEST FLOATING SOLAR PLANT

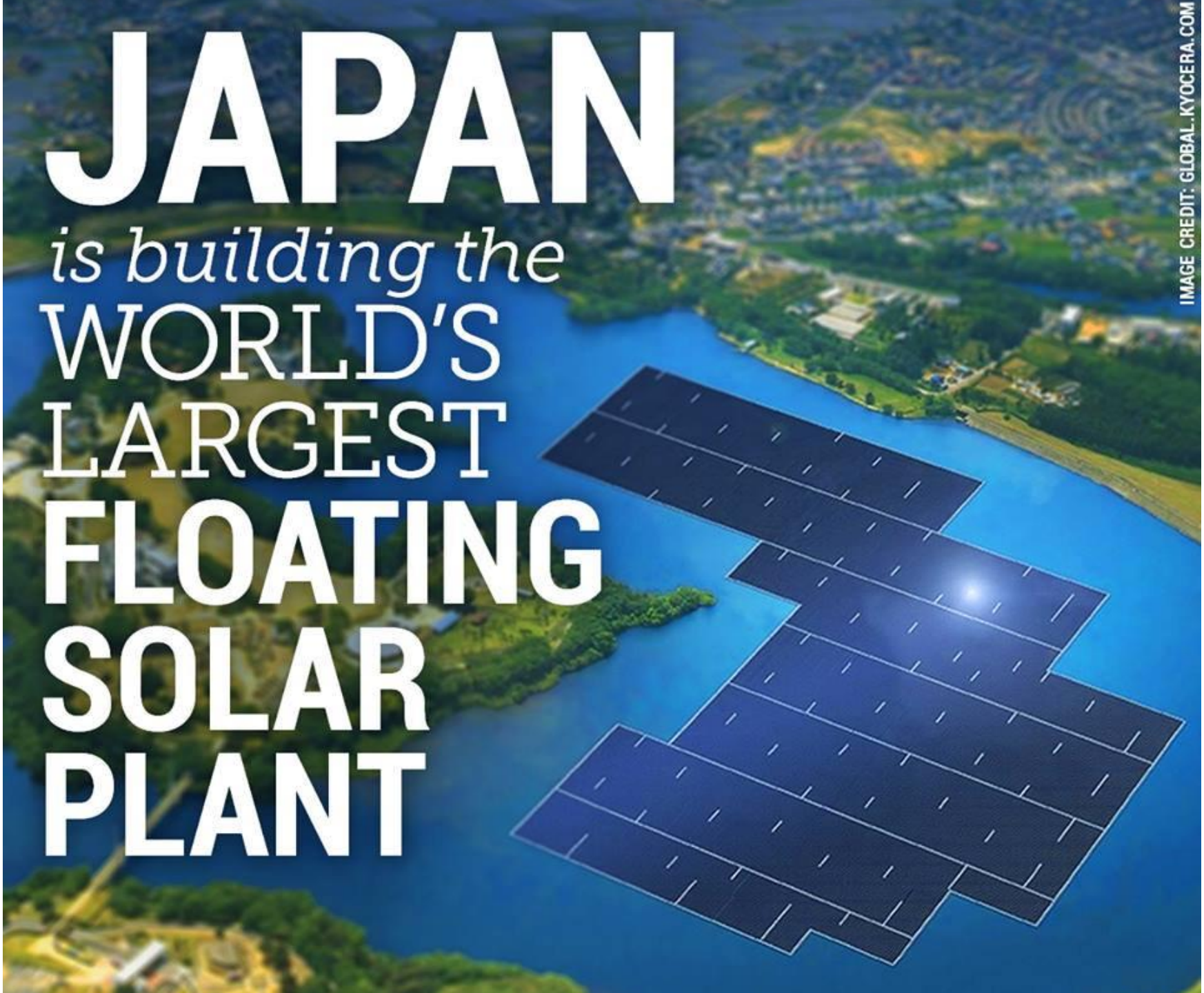

IMAGE CREDIT: GLOBAL.KYOCERA.COM

Floating Solar in China

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Thank you

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www.ckrb.org/

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